UNCLASSIFIED

AD NUMBER
AD832195
LIMITATION CHANGES
TO: **Approved for public release; distribution is unlimited.**
FROM: **Distribution authorized to U.S. Gov't. agencies and their contractors; Critical Technology; MAR 1968. Other requests shall be referred to Air Force Technical Application Center, Washington, DC 20333. This document contains export-controlled technical data.**
AUTHORITY
usaf ltr, 25 jan 1972 xxx

THIS PAGE IS UNCLASSIFIED

AD832195

TR 68-17

TECHNICAL REPORT NO. 68-17

OPERATION OF
THE TONTO FOREST SEISMOLOGICAL OBSERVATORY
Quartely Report No.1, Project VT/8702
1 January through 31 March 1968

STATEMENT #2 UNCLASSIFIED

This document is subject to special export controls and each transmittal to foreign governments or foreign nationals may be made only with prior approval of AF Tactical Applications Center, attn: VSC, Wash DC. 20333

DDC
RECEIVED
MAY 20 1968
C

GEOTECH
A TELEDYNE COMPANY

TECHNICAL REPORT NO. 68-17

OPERATION OF THE TONTO FOREST SEISMOLOGICAL OBSERVATORY

Quarterly Report No. 1, Project VT/8702
1 January through 31 March 1968

Sponsored by

Advanced Research Projects Agency
Nuclear Test Detection Office
ARPA Order No. 624

GEOTECH
A Teledyne Company
3401 Shiloh Road
Garland, Texas

15 April 1968

IDENTIFICATION

AFTAC Project No:	VELA T/8702
Project Title:	Operation of TFSO
ARPA Order No:	624
ARPA Program Code No:	8F10
Name of Contractor:	Teledyne Industries Incorporated Geotech Division Garland, Texas
Date of Contract:	1 January 1968
Amount of Contract:	Not negotiated
Contract Number:	AF 33657-68-C-0766
Contract Expiration Date:	31 December 1968
Program Manager:	B. B. Leichliter, BR1-2561

CONTENTS

CONTENTS, Continued

ILLUSTRATIONS

TABLES

ABSTRACT

This is a report of the work accomplished on Project VT/8702 from 1 January through 31 March 1968. Project VT/8702 includes the operation, evaluation, and improvement of the Tonto Forest Seismological Observatory (TFSO) located near Payson, Arizona. It also includes special research and test functions carried out at TFSO and research and development tasks performed by the Garland, Texas, staff using TFSO data.

BLANK PAGE

OPERATION OF THE TONTO FOREST SEISMOLOGICAL OBSERVATORY

1. INTRODUCTION

1.1 AUTHORITY

The research described in this report was supported by the Advanced Research Projects Agency, Nuclear Test Detection Office and was monitored by the Air Force Technical Applications Center (AFTAC) under Letter Contract AF 33657-68-C-0766. The effective date of the contract is 1 January 1968; the statement of work for Project VT/8702 is included as the appendix to this report.

1.2 HISTORY

The Tonto Forest Seismological Observatory (TFSO) was constructed by the United States Corps of Engineers in 1963. TFSO was designed to record seismic events and to be used as a laboratory for testing, comparing, and evaluating advanced seismograph equipment and seismometric recording techniques. The instrumentation was assembled, installed, and operated until 30 April 1965, by the Earth Sciences Division of Teledyne Industries, under Contract AF 33(657)-7747. On 1 May 1965, Geotech assumed the responsibility for operating TFSO. The location of TFSO is shown in figure 1.

2. OPERATION OF TFSO

2.1 GENERAL

Data are recorded at TFSO on a 24-hour-a-day basis. The observatory is manned continuously. A full complement of personnel is on duty 8 hours a day, 5 days a week; at other times, a reduced operating crew is on duty.

2.2 STANDARD SEISMOGRAPH OPERATING PARAMETERS

The operating parameters and tolerances for the TFSO standard seismographs are shown in table 1. Frequency response tests are made routinely, and

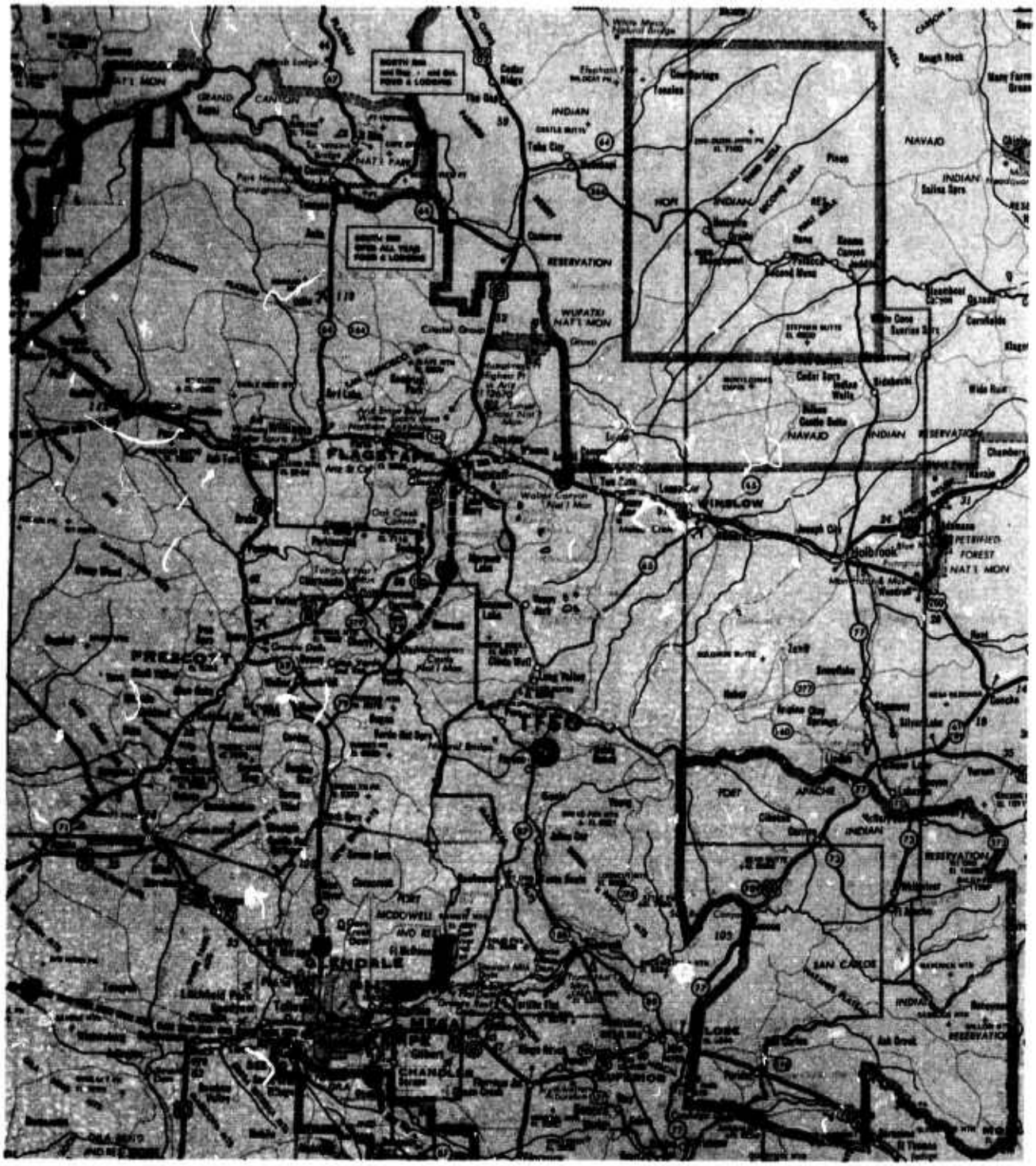

Figure 1. Location of TFSO

G 650

Table 1. Operating parameters and tolerances of standard seismographs at TFSO

Seismograph				Operating parameters and tolerances				Filter settings		
System	Comp	Type	Model	Ts	λs	Tg	λg	δ^2	Bandpass at 3 dB cutoff (sec)	Cutoff rate at SP side (dB/oct)
SP[a]	Z	Johnson-Matheson	6480	1.25 ±2%	0.54 ±5%	---	---	0.0000	0.3 - 10	6
SP[b]	Z	Johnson-Matheson	6480	1.25 ±2%	0.54 ±5%	0.33 ±5%	0.65 ±5%	0.0117	0.1 - 100	12
SP[b]	H	Johnson-Matheson	7515	1.25 ±2%	0.54 ±5%	0.33 ±5%	0.65 ±5%	0.0117	0.1 - 100	12
SP	Z	Benioff	1051	1.0 ±2%	1.0 ±5%	0.2 ±5%	1.0 ±5%	0.0104	0.1 - 100	12
SP	H	Benioff	1101	1.0 ±2%	1.0 ±5%	0.2 ±5%	1.0 ±5%	0.0104	0.1 - 100	12
SP	Z	UA Benioff	1051	1.0 ±2%	1.0 ±5%	0.75	1.0 ±5%	0.0245	---	--
SP	H	UA Benioff	1101	1.0 ±2%	1.0 ±5%	0.75	1.0 ±5%	0.0245	---	--
SP	H	Wood-Anderson	TS 220	0.8	0.78	---	---	---	---	--
IB	Z	Melton	10012	2.25 ±5%	0.65 ±5%	0.64 ±5%	1.2 ±5%	0.0006	0.05 - 100	18
IB	H	Lehner-Griffith	SH-216	2.25 ±5%	0.65 ±5%	0.64 ±5%	1.2 ±5%	0.0004	0.05 - 100	18
LP	Z	Geotech	7505A	20.0 ±5%	0.77	---	---	0.00	80 - 300	6
LP	H	Geotech	8700C	20.0 ±5%	0.77	---	---	0.00	80 - 300	6

KEY

SP Short period
IB Intermediate band
LP Long period
UA Unamplified (i.e., earth powered)

Ts Seismometer free period (sec)
Tg Galvanometer free period (sec)
λs Seismometer damping constant
λs Galvanometer damping constant
δ^2 Coupling coefficient

[a] 37-element hexagonal array
[b] Linear array and 3 comp

parameters are checked and reset to maintain the specified tolerances.

Normalized response characteristics of TFSO standard seismographs are shown in figure 2. In addition to these standard seismographs, two filtered summation seismographs are recorded. One ΣTF seismograph is filtered by a UED filter with a high-cut frequency of 1.75 cps and a slope of 12 dB per octave. This seismograph is recorded on 16-millimeter film data trunks 1 and 7 and on magnetic-tape data trunks 2 and 5. The second ΣTFK seismograph utilizes a Krohn-Hite filter; the high-cut frequency is set at 2.0 cps with a slope of 24 dB per octave, and the low-cut frequency is set at 1.0 cps with a slope of 24 dB per octave. This filtered seismograph is recorded on 16-millimeter film data trunk 1.

2.3 DATA CHANNEL ASSIGNMENTS

Each data format recorded at TFSO is assigned a data group number. When a data format is changed, a new data group number is assigned. Several data format change notices reporting changes in channel assignments were submitted to the Project Officer and to frequent users of TFSO data during this reporting period.

2.4 COMPLETION AND SHIPMENT OF DATA

The magnetic-tape seismograms are shipped from TFSO each week. Six magnetic-tape recorders are used to record data for the AFTAC VELA Seismological Center (VSC).

Film seismograms from 10 Develocorders are routinely shipped to data users. The film and magnetic-tape operation logs and calibration logs are copied and shipped with the seismograms. Copies of selected film-seismogram data are sent to the Geotech Program Manager regularly and to other data users on special request. The shipments of 16-millimeter film seismograms routinely sent to the Seismic Data Laboratory (SDL) repository are complete through January 1968, except for selected seismograms being held for use in conjunction with special investigations or instrument tests that are in progress.

2.5 QUALITY CONTROL

2.5.1 Quality Control of 16-Millimeter Film Seismograms

Quality control checks of randomly selected 16-millimeter film seismograms from data trunks 1, 2, and 8, and the associated operation logs are made in

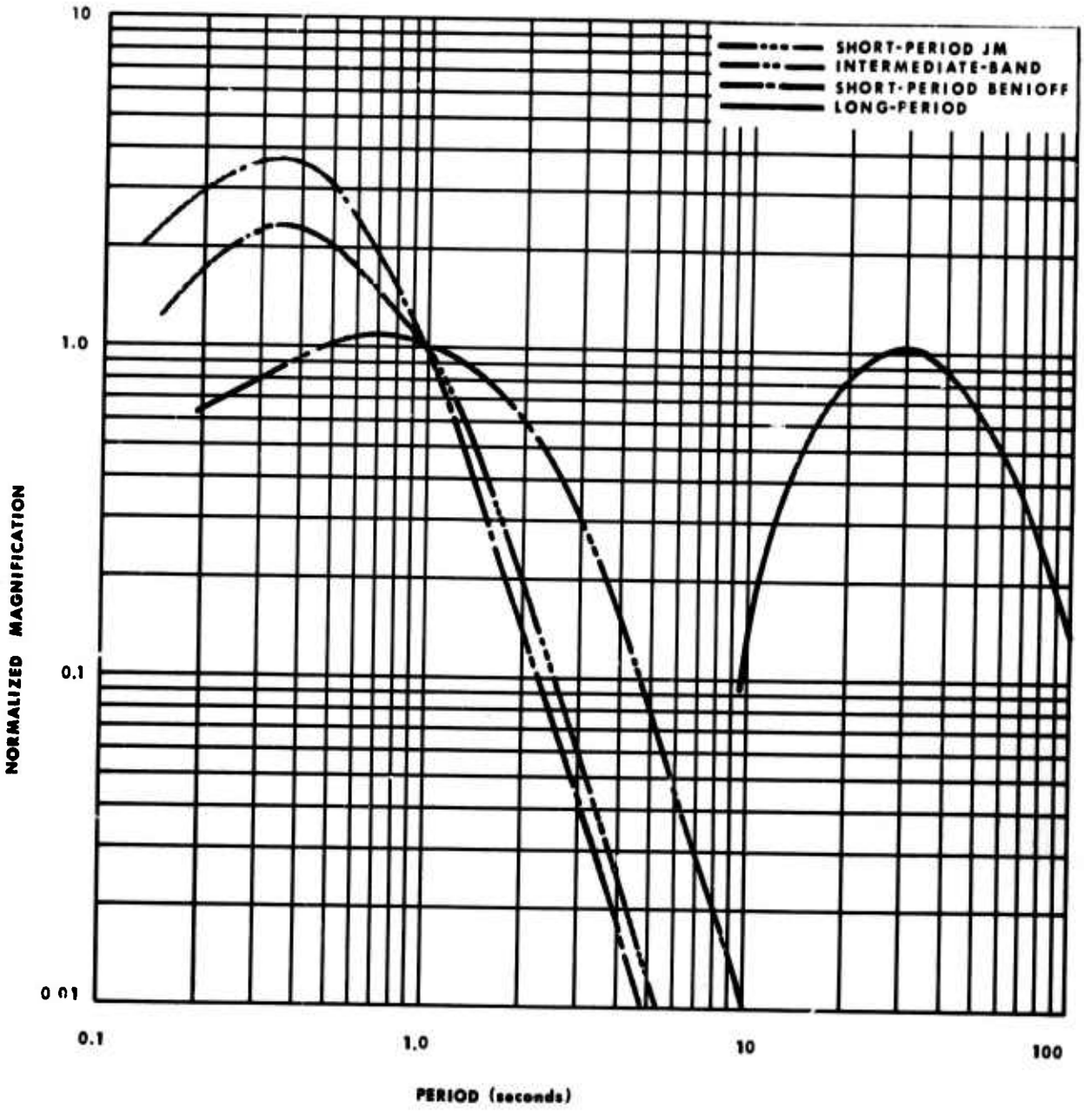

Figure 2. Normalized response characteristics of standard seismographs at TFSO

Garland. Items that are routinely checked by the Quality Control Analyst include:

a. Film boxes - neatness and completeness of box markings;

b. Develocorder logs - completeness, accuracy and legibility of logs;

c. Film:

(1) Quality of the overall appearance of the record (for example, trace spacing and tract intensity);

(2) Quality of film processing;

d. Analysis - completeness, legibility, and accuracy of the analysis sheets.

Results of these evaluations are sent to the observatory for their review and comment.

2.5.2 Quality Control of Magnetic-Tape Seismograms

Routine quality control checks of randomly selected magnetic-tape seismograms were made in Garland and at TFSO to assure that recordings met specified standards. The following are among the items that were checked by the Quality Control Group:

a. Tape and box labeling;

b. Accuracy, completeness, and neatness of logs;

c. Adequate documentation of logs by voice comments on tape where applicable;

d. Seismograph polarity;

e. Level of calibration signals;

f. Relative phase shift between array seismographs;

g. Level of the microseismic background noise;

h. Level of the system noise;

i. PTA dc balance;

j. Oscillator alignment;

k. Quality of the recorded WWV signal where applicable;

l. Time-pulse carrier;

m. Binary coded digital time marks.

2.6 SMALL BUSINESS ADMINISTRATION VISIT

Mr. C. P. Fink of the Phoenix office of the Los Angeles Defense Contract Administration Services Region (DCASR) and Mr. H. Clinkert, Small Business Administration from Phoenix visited TFSO on 19 January in compliance with the regulations of the Small Business Administration.

2.7 SECURITY INSPECTION

Mr. K. G. Ozbolt, Industrial Security Inspector from Phoenix, Arizona, made a routine security inspection of the observatory on 18 January 1968. All security procedures were found to be in order.

2.8 EMERGENCY POWER GENERATOR

The emergency power generator was operated only 25 hours during the reporting period. Approximately 66 percent of the emergency power operation was required because of activity that resulted in commercial power fluctuations and outages.

3. EVALUATE DATA AND DETERMINE OPTIMUM OPERATIONAL CHARACTERISTICS

3.1 SHORT-PERIOD ARRAY SYSTEMS MODIFICATIONS

Most of January and February were spent replacing cable and making repairs to the 30-kilometer short-period array. All systems were considered operational by 26 February.

Tests were conducted during March to determine a method of eliminating the noise and spiking which occurred on the seismograms when the line leakage resistance became low, due to moisture. Known bad cables, grounded test lines, cables submerged in water, and water-soaked hocks were installed in some of the systems to simulate line leakages which would cause noise and spiking.

From these tests it was found that a ground loop existed between the point of the line leakage and the negative side of the power supply. The negative side of the power supply was grounded and was causing some of the spiking. The ground loop was eliminated by removing the negative side of the power supply from ground and installing a 10.0 μF capacitor between the negative side of the power supply and ground. Removing the ground loop did not eliminate all of the spiking. Also, line leakage produced changes of as much as 30 Vdc at the vault between either side of the line and ground while the 24 Vdc measured across the line at the vault appeared to be constant. This change in voltage was causing spiking because of an unbalanced circuit condition in the vault isolation filter. To balance the circuit, a 1.0 μF capacitor was installed in the vault isolation filter between the positive side of the power line and ground. (See figure 3.)

These modifications eliminated the spiking of the systems tested, but final evaluation of the modifications cannot be made until several severe storms have been experienced in the area. Systems Z1 through Z10, Z12, and Z25 have been modified, and no instances of noise or outages have been observed on these systems due to excessive moisture. As time permits, we are installing these modifications in all of the other short-period array circuits except Z33, Z34, Z35, and Z37, which will be left unmodified for use as standards for comparison, and Z36, which will be operated from battery power.

3.2 MAINTAIN TFSO FACILITIES

Severe low temperatures at Payson this winter caused several breaks in one of the building air conditioner coils. These coils are normally protected by a thermostat which shuts off outside air when the temperature drops to below 50 degrees Fahrenheit. However, water collects in the low portions of the coils; and if unusually cold weather prevails, the water will freeze and the coils may break.

The coils were repaired and replaced. In addition, the station will add an automatic drain valve to the system which will drain automatically as the thermostat shuts off the flow of outside air.

4. ANALYZE DATA

4.1 DAILY REPORTS TO THE COAST AND GEODETIC SURVEY

TFSO reports the arrival time, period, and peak amplitude of events recorded at TFSO to the Director of the Environmental Science Services Administration's

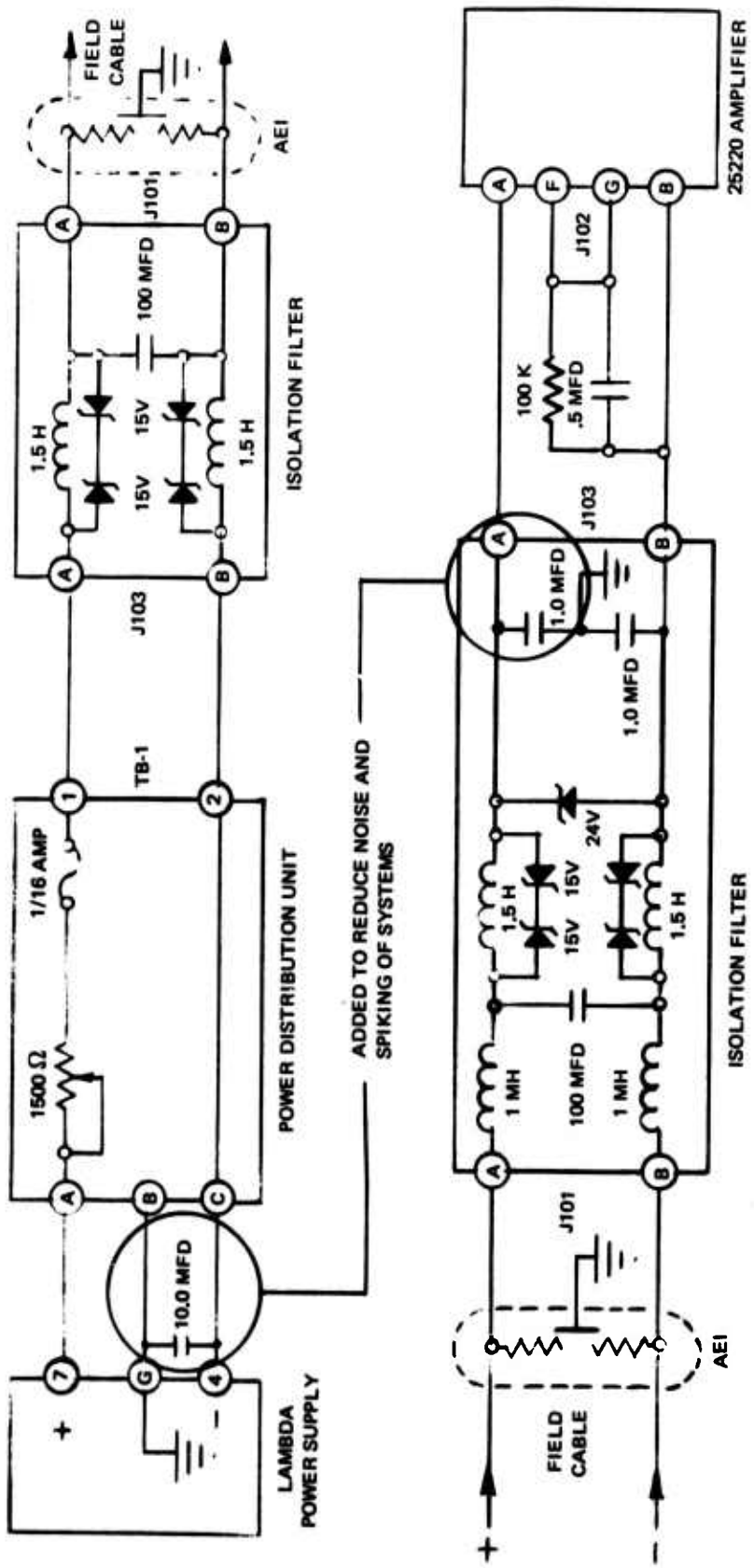

Figure 3. Block diagram of the power system for the short-period seismographs showing modifications made to system to reduce noise and spiking due to line leakage

Coast and Geodetic Survey in Washington, D. C., daily. The number of events reported by TFSO during each month of the reporting period is shown in table 2, by type.

Table 2. Events reported to the C&GS by TFSO during January, February, and March 1968

Month	Local	Near regional	Regional	Teleseisms	Total
January	6	97	17	1016	1136
February	4	88	24	835	951
March	8	76	11	885	980

The number of events reported by C&GS in their "Earthquake Data Report" for September, October, and November 1967, are given in table 3. Also shown in table 3, by month, are the percentages of the C&GS hypocenters in which TFSO data were used to establish the location; the percentages of the C&GS hypocenters from which TFSO recorded a P or PKP arrival, based on associated data; and the percentages of the C&GS hypocenters from which TFSO recorded a P, PKP, or later phase, based on updated ABP associated data. Figures 4 and 5 show the world-wide distribution of the C&GS-located epicenters for August, September, and October 1967. The three types of symbols used to show the epicentral locations represent the detection, by TFSO, of a P or PKP phase; the detection of an event in which the first recorded arrival was not P or PKP; and no detection by TFSO.

4.2 DAILY ANALYSIS FOR MULTISTATION EARTHQUAKE BULLETIN

Data from TFSO are combined with data from CPSO, BMSO, UBSO, and WMSO and published in a monthly multistation earthquake bulletin. The bulletins for September and October 1967, were published during this reporting period, and the ABP output for November was being published at the end of the quarter.

4.3 ROUTINE NOISE SURVEY

Measurements of ambient noise in the 0.4- to 1.4-second period range are made from the short-period 16-millimeter film seismograms, daily, at TFSO. Data are processed in Garland, and monthly cumulative probability curves of trace amplitude and ground displacement as recorded on the Z60,

Table 3. Percentage of hypocenters reported in the C&GS "Earthquake Data Report" for which TFSO data were used

Month	No. events reported by TFSO	No. C&GS hypocenters	Percent of C&GS hypocenters for which the C&GS listed a TFSO P or PKP arrival	Percent of C&GS hypocenters for which TFSO recorded a P or PKP phase, based on associated data	Percent of C&GS hypocenters for which TFSO recorded a P, PKP, or later phase based on updated associated data
September	1166	411	53.4	60.9	69.9
October	1059	388	57.2	68.3	74.0
November	1152	390	62.1	71.7	75.8

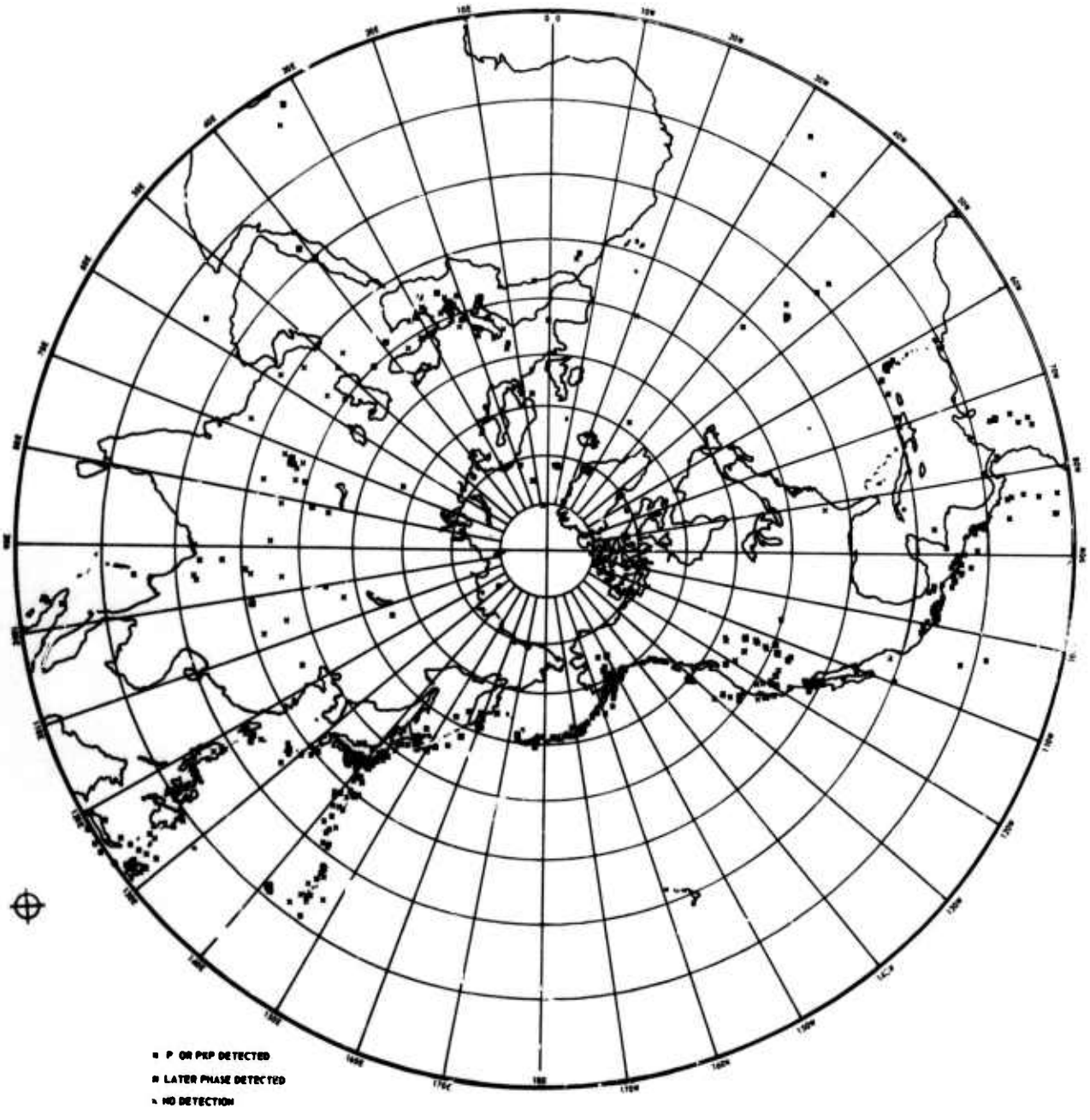

Figure 4. Distribution of Coast and Geodetic Survey located epicenters in the northern hemisphere for August, September, and October 1967.

G 3179

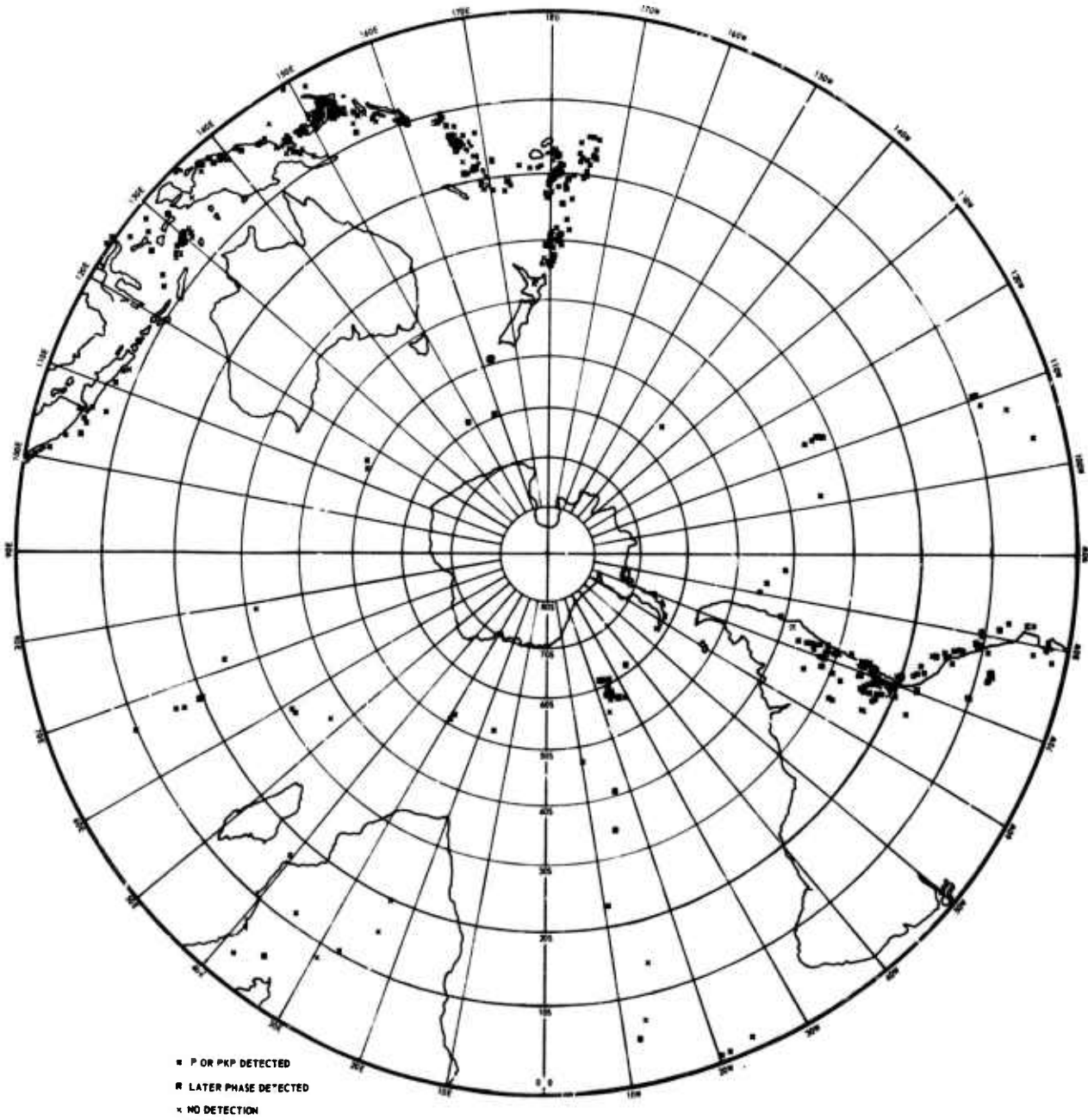

Figure 5. Distribution of Coast and Geodetic Survey located epicenters in the southern hemisphere for August, September, and October 1967.

ΣT, and ΣTF seismograms are published. Curves for the months of December and January 1968, were sent to the Project Officer during this reporting period.

5. PROVIDE OBSERVATORY FACILITIES AND ASSISTANCE TO OTHER ORGANIZATIONS

5.1 ASTRODATA DATA ACQUISITION SYSTEM

Final modifications and check-out of the Astrodata system were completed in mid-January. Recording of digital data on a 24-hour basis was started about 15 February and has continued through the rest of the reporting period except for 5 days in March. On 10 March, the input amplifier to the analog-to-digital converter failed. This problem was resolved and repaired on 15 March.

Both tape transport vacuum motors were replaced, and new recording and playback heads were installed during this reporting period. Station personnel are presently considering the possibility of building an automatic "overload" reset circuit, which would improve the reliability of the data and reduce the effort required for monitoring the Astrodata system operation by the station operators.

5.2 TELEMETRY TO MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Telemetry of seven seismograph channels to Lincoln Laboratory, Massachusetts Institute of Technology (MIT), continued throughout this reporting period. MIT is notified, in advance when possible, if the seismographs are to be attenuated for special tests.

5.3 ASTROGEOLOGICAL DEPARTMENT OF THE U.S. GEOLOGICAL SURVEY

TFSO has continued to support Dr. Harold Krivoy of the Astrogeological Department of the United States Geological Survey (USGS) in Flagstaff, Arizona. Dr. Krivoy receives copies of the daily station message and all TFSO Helicorder records, not needed by the observatory, on a regular basis.

5.4 VISITORS

5.4.1 Visits by School Groups

Arizona State University students and instructors visited TFSO on 22 March. Approximately 75 visitors were given tours of the observatory and brief lectures on seismology.

5.4.2 Teledyne Visitors

Mr. Arnold Sisson, program engineer, visited the station from 4 through 19 January and from 14 through 21 March for the purpose of testing short-period array cable and to aid in long-period array setup.

Mr. Joe Herrage, C. Perry, A. Krowezyk, K. King, and G. Rude, visited the station from 31 January through 23 February for the purpose of assisting in short-period array repair.

5.4.3 Visits by Project Managers

Captain F. D. Munzlinger, AFTAC Project Officer, and Mr. B. B. Leichliter, Geotech Program Manager, were visitors at TFSO from 29 January through 1 February 1968.

Mr. J. M. Whalen, Geotech Geosciences Division Manager, was a visitor at TFSO on 11 January 1968.

5.4.4 Texas Instruments Visit

Mr. A. Fox, Texas Instruments engineer, was at the station from 20 through 26 March to install, activate, and check the multichannel filter processor (MCF).

6. RESEARCH PROGRAMS

6.1 DESIGN AND INSTALL A LONG-PERIOD ARRAY

6.1.1 Land Permitting

The United States Corps of Engineers received a new amendment to the Memorandum of Agreement from the United States Forest Service about 1 March. A copy of this amendment and approval has not been received at TFSO.

6.1.2 Array Installation

At the end of this reporting period, sites LP1, LP2, LP3, LP6, and LP7 were operational with data being recorded from the seismographs at each site. Site LP4 was completed and fully instrumented; however, because of a delay in delivery of equipment to Mountain States Telephone Company, the site will not become fully operational until about 10 April.

A camp was established at the LP5 site, and construction was started on 25 March. Vault installation was completed by 29 March; we plan to install the instruments by 3 April. The generator and microwave installation for LP5 is scheduled to be completed by 5 April. Our application for a microwave license is still pending with the Federal Communications Commission. Some problems developed in the 2-wire circuit furnished to the telephone company. The circuits are routed through a 4-wire termination set at each end; however, some cross-talk problems exist. A filter was designed, and its effectiveness in reducing the cross-talk was evaluated. The effectiveness of this filter was limited; however, based on the results of the tests, other filter networks are being designed for these two circuits.

Data from all sites except LP1 are approximately 6 dB noisier than normal due to the fact that final vault covering has not yet been completed, and the instruments have not fully stabilized. This work, along with final site cleanup, is scheduled to be started about 15 April.

6.1.3 Long-Period Site Survey

Preliminary survey data have been received for all long-period sites. The sites were surveyed to a wooden "marker" stake because the vaults had not been constructed at the time of the survey. The offset between the stake and center vault has been surveyed at each site; the corrections should be applied to the final coordinates when they are received from the 1381st Geodetic Survey Squadron.

6.2 EVALUATION OF A HIGH-FREQUENCY SEISMOGRAPH

The high-frequency seismograph was received at TFSO during this reporting period; however, we have not yet installed it for testing. Installation is planned for April.

6.3 MULTICHANNEL FILTER PROCESSOR

The MCF was received at TFSO in early February, and we established input-output lines; however, we could not activate the processor until mid-March when a modified power supply was received from the power supply

manufacturer. By the end of March the MCF was operating, and a program received from the Project Officer had been implemented. Two changes were made to the power circuits: A larger power input plug was installed to alleviate a serious heating and shorting problem at the radio interference filter input; and the cooling blower units were removed from the main power line circuit and re-routed directly to an external power source.

The auxiliary processor rack was checked and found to be operating properly. The auxiliary processor is presently not connected to the MCF so that the power load could be dropped. The TI representative conducted a short course in programming, machine processes, and troubleshooting for three TFSO personnel.

Ten beam-formed outputs are presently being recorded on 16-millimeter film. The magnification of these seismographs at their steered azimuth and velocities is about 7000K at 1 cps. The reference timing is delayed with reference to Z1. All short-period channels except six (Z3, Z5, Z7, Z8, Z12, and Z16) are used in forming the beams. The beams presently being recorded, are given in table 4, and examples of the response of the beam-formed outputs to teleseismic signals are shown in figures 6, 7, and 8.

Table 4. Beams being formed by the multichannel filter using TFSO short-period array seismographs

Beam Identifier	Steered Azimuth (degrees)	Steered Horizontal Velocity (kilometers/second)	Distance (degrees)
BS0	353.8	25	97
BS1	317.1	18	70
BS2	318.6	16	60
BS3	311.1	15	51
BS4	329.1	13	36
BS5	4.2	19	72
BS6	248.5	22	85
BS7	129.7	12	27
BS8	137.5	18	67
BS9	29.1	16	61

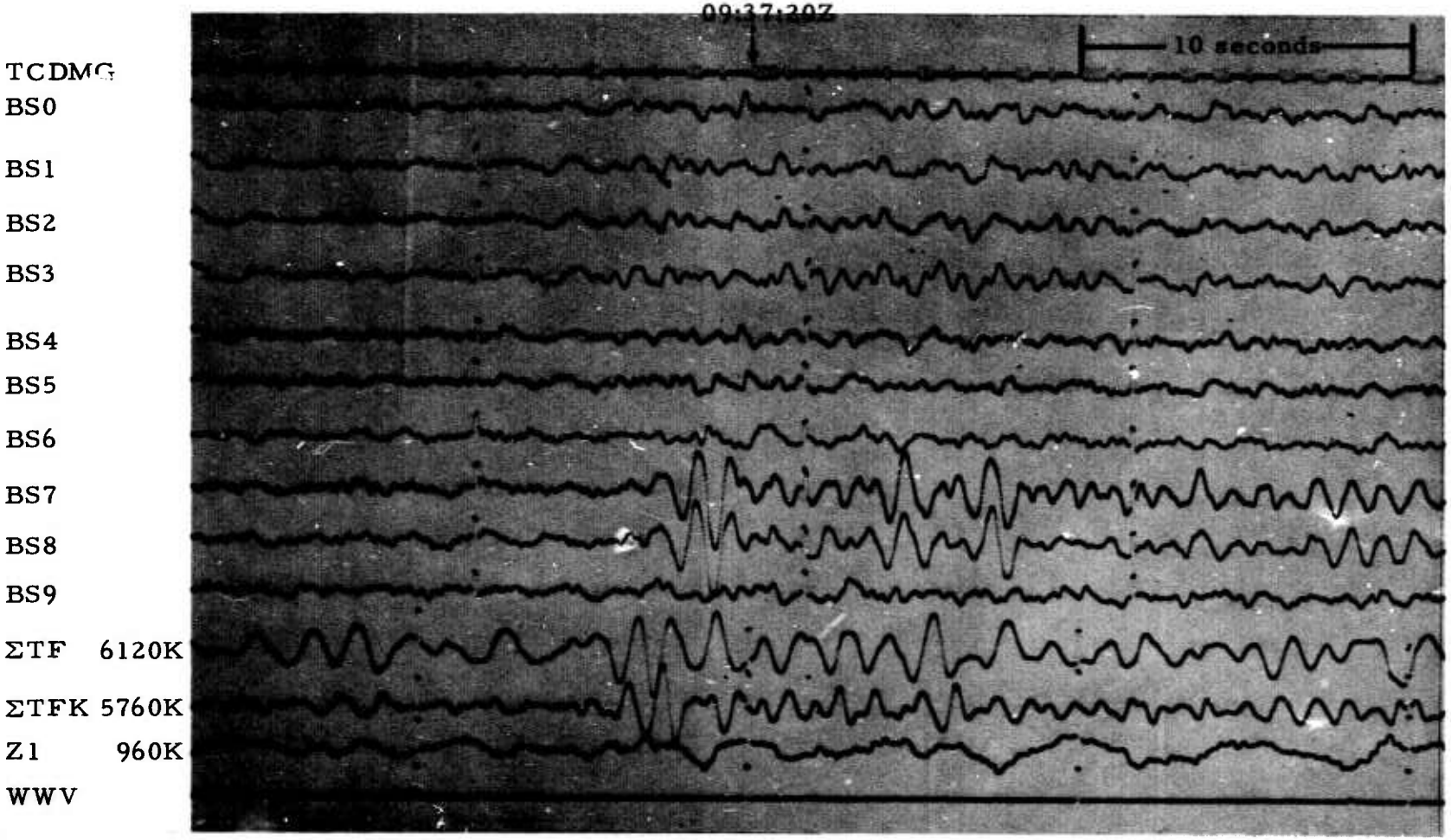

Figure 6. TFSO short-period seismogram showing the beam-formed MCF outputs responding to a teleseismic P arrival from the southeast - epicenter unknown. (X10 enlargement of 16-millimeter film)

TFSO
29 Mar 1968
RPN 089
DG 7264

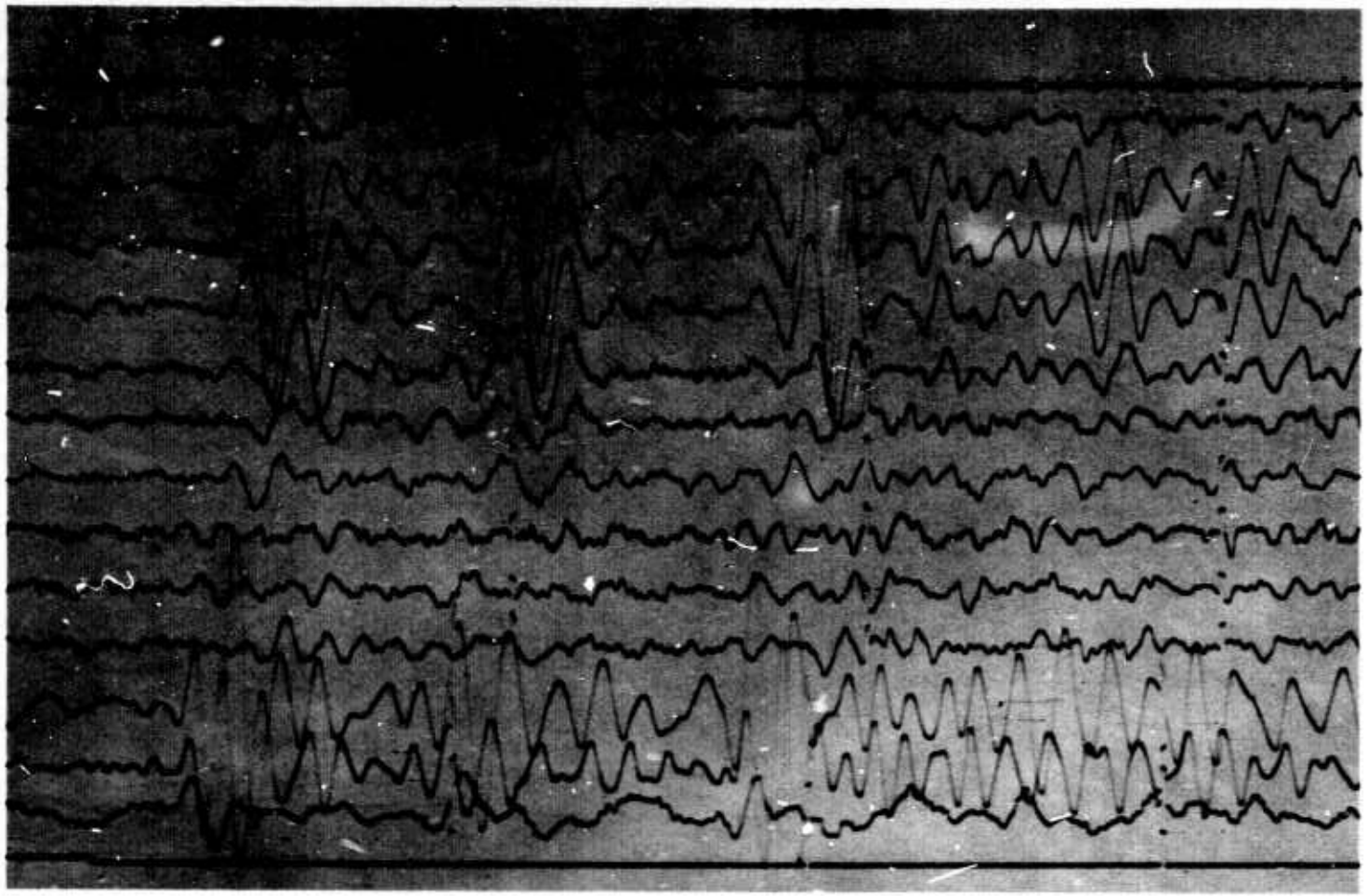

Figure 7. TFSO short-period seismogram showing the beam-formed MCF outputs responding to a teleseismic P arrival from the northwest - epicenter unknown. (X10 enlargement of 16-millimeter film)

TFSO
29 Mar 1968
RPN 089
DG 7264

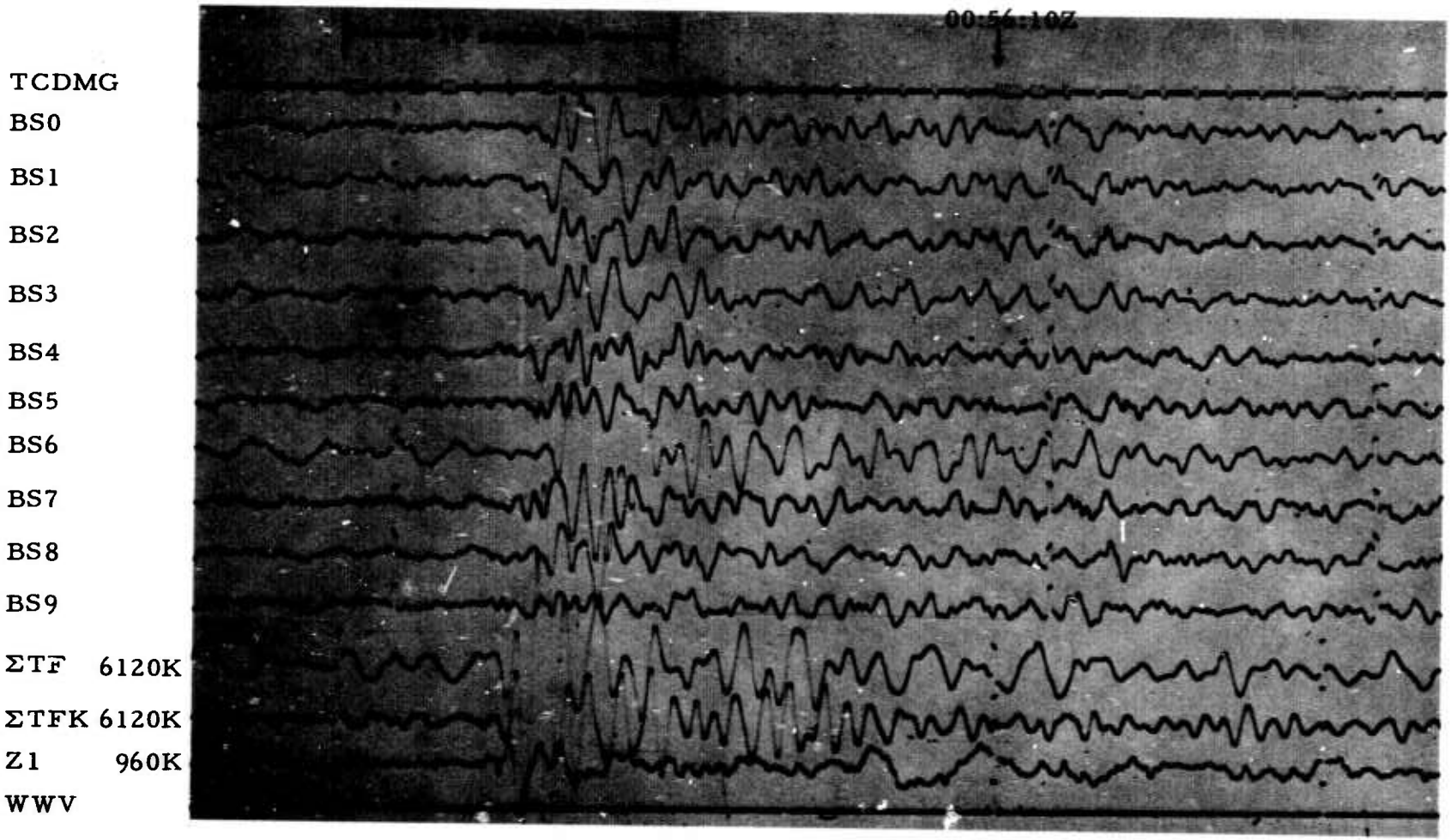

Figure 8. TFSO short-period seismogram showing the beam-formed MCF outputs responding to a teleseismic P arrival from the west-southwest - epicenter unknown. (X10 enlargement of 16-millimeter film)

TFSO
30 Mar 1968
RPN 090

APPENDIX TO TECHNICAL REPORT NO. 68-17

STATEMENT OF WORK TO BE DONE

STATEMENT OF WORK TO BE DONE
(AFTAC Project Authorization No. VELA T/8702/S/ASD) (32)

Task:

a. Operation:

(1) Continue operation of the Tonto Forest Seismological Observatory (TFSO), normally recording data continuous

(2) Evaluate the seismic data to determine optimum operational characteristics and make changes in the operating parameters as may be required to provide the most effective observatory possible. Addition and modification of instrument are within the scope of work. However, such instrument modifications and additions, data evaluation, and major parameter changes are subject to the prior approval of the AFTAC project officer.

(3) Conduct routine daily analysis of seismic data at the observatory and transmit daily seismic teletype reports to the Coast and Geodetic Survey, Environmental Science Services Administration, Washington Science Center, Rockville, Maryland, using the established report format and detailed instructions.

(4) Record the results of daily analysis on magnetic tape in a format compatible with the automated bulletin program used by the Seismic Data Laboratory (SDL) in their preparation of the seismological bulletin of the VELA-UNIFORM seismological observatories. The format should be established by coordination with SDL through the AFTAC project officer. The schedule of routine shipments of these prepared magnetic tapes to SDL will be established by the AFTAC project officer.

(5) Establish quality control procedures and conduct quality control, as necessary, to assure the recording of high quality data on both magnetic tape and film. Past experience indicates that a quality control review of one magnetic tape per magnetic tape recorder at the observatory during each week is satisfactory unless quality control tolerances have been exceeded and the necessity of additional quality control arises. Quality control of magnetic tape should include, but need not necessarily be limited to, the following items:

(a) Completeness and accuracy of operation logs.

(b) Accuracy of observatory measurements of system noise and equivalent ground motion.

(c) Quality and completeness of voice comments.

(d) Examination of all calibrations to assure that clipping does not occur.

REPRODUCTION

(e) Determination of relative phase shift on all array seismographs.

(f) Measurement of DC unbalance.

(g) Presence and accuracy of tape calibration and alignment.

(h) Check of uncompensated noise on each channel.

(i) Check of uncompensated signal-to-noise of channel 7.

(j) Check of general strength and quality of timing data derived from National Bureau of Standards Station WWV.

(k) Check of time pulse modulated 60 cps on channel 14 for adequate signal level and for presence of time pulses.

(l) Check of synchronization of digital time encoder with WWV.

(6) Provide observatory facilities, accompanying technical assistance by observatory personnel, and seismological data to requesting organizations and individuals after approval by the AFTAC project officer.

(7) Maintain, repair, protect, and preserve the facilities of TFSO in good physical condition in accordance with sound industrial practice.

b. Instrument Evaluation: On approval by the AFTAC project officer, evaluate the performance characteristics of experimental or off-the-shelf equipment offering potential improvement in the performance of observatory seismograph systems. Operation and test of such instrumentation under field conditions should normally be preceded by laboratory test and evaluation.

c. Special Investigations:

(1) Conduct research investigations as approved or requested by the AFTAC project officer to obtain fundamental information which will lead to improvements in the detection capability of TFSO. These programs should take advantage of geological, meteorological, and seismological conditions of the observatory. The following special studies should be accomplished:

(a) Evaluate the beam-steering capabilities of the 30-kilometer long- and short-period vertical seismometer arrays.

(b) Determine the detection capabilities of the 30-kilometer long- and short-period vertical seismometer arrays.

REPRODUCTION

(c) Study the properties of the noise field with the new arrays.

(d) Determine the reliability of instrumentation in the new arrays.

(2) Research might pursue investigations in, but is not necessarily limited to, the following areas of interest: microseismic noise, signal characteristics, data presentation, detection threshold, and array design (surface and shallow borehole).

(3) Prior to commencing any research investigation, AFTAC approval of the proposed investigation and of a comprehensive program outline of the intended research must be obtained.

REPRODUCTION

Unclassified

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author)
Geotech, A Teledyne Company
3401 Shiloh Road
Garland, Texas

2a. REPORT SECURITY CLASSIFICATION
Unclassified

2b. GROUP

3. REPORT TITLE
Operation of the Tonto Forest Seismological Observatory
Quarterly Report No. 1, Project VT/8702, 1 January through 31 March 1968

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

5. AUTHOR(S) (First name, middle initial, last name)
Geotech Staff

6. REPORT DATE
15 April 1968

7a. TOTAL NO. OF PAGES
33

7b. NO. OF REFS

8a. CONTRACT OR GRANT NO.
AF 33657-68-C-0766

b. PROJECT NO.
VELA T/8702

c.
ARPA Order No. 624

d. ARPA Program Code No. 6F10

9a. ORIGINATOR'S REPORT NUMBER(S)
TR 68-17

9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

10. DISTRIBUTION STATEMENT
This document is subject to special export controls and each transmittal to a foreign national may be made only with prior approval of the Chief of AFTAC.

11. SUPPLEMENTARY NOTES

12. SPONSORING MILITARY ACTIVITY
Advanced Research Projects Agency
Nuclear Test Detection Office
Washington, D. C.

13. ABSTRACT

This is a report of the work accomplished on Project VT/8702 from 1 January through 31 March 1968. Project VT/8702 includes the operation, evaluation, and improvement of the Tonto Forest Seismological Observatory (TFSO) located near Payson, Arizona. It also includes special research and test functions carried out at TFSO and research and development tasks performed by the Garland, Texas, staff using TFSO data.

DD FORM 1 NOV 65 1473

Unclassified

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Long-period array						
On-line beamforming						
37-element short-period array						
Seismograph operating parameters						